Soil Quality

. . . key to absorbing and infiltrating rainfall

NRCS Natural Resources Conservation Service

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Soil Quality

Soil is an important, but often overlooked component of water management. Soil quality refers to the ability of soil to perform its functions. Soil is especially important in regulating runoff of storm water and in supporting trees, shrubs, lawns and gardens. Urban activities, such as construction grading, often result in erosion, sedimentation and soil compaction. Management practices are often needed to restore soil quality after development.

Erosion

Erosion on construction sites is one of the most serious problems facing urban soil quality. Erosion, which produces sediment, is accelerated when soil is disturbed or left bare and exposed to wind and water. Although erosion on construction sites often affects only a small percentage of a watershed, it can be a major source of sediment. The potential for erosion can be 100 times greater than on agricultural land and the delivery rate to receiving waters is much higher.

Compaction

Compaction is the other serious issue facing urban soil quality. It occurs when soil particles are pressed together. As soil particles are squeezed together, soil density increases and pore space for air and water are reduced. Lack of pore space in the soil reduces water intake and movement throughout its layers. Compaction also limits root growth and the biological diversity of the soil. These problems are compounded when organic matter content is lost by topsoil removal. For homeowners, compacted soil with low organic matter makes it difficult to establish and maintain lawns and landscaping. In urban communities, soil compaction can lead to low infiltration rates, increased erosion and storm water runoff, decreased water quality due to more polluted runoff, and increased flooding.

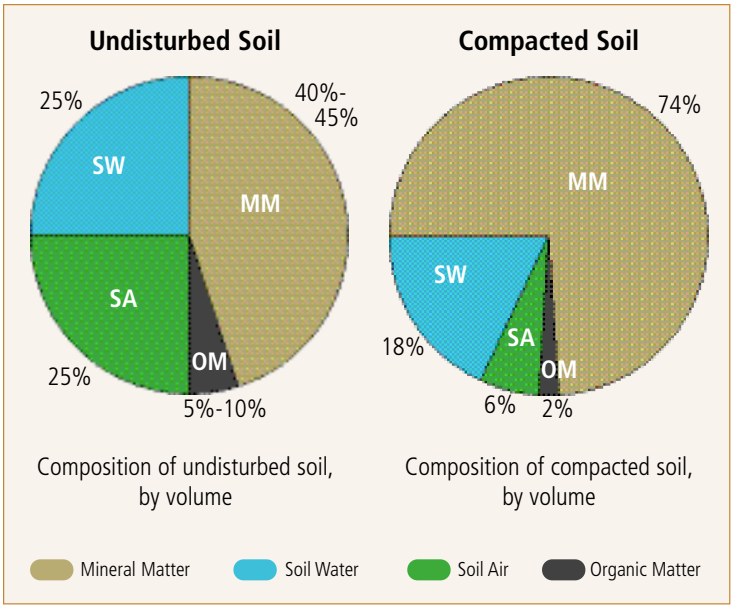
Construction grading compacts the soil and exposes land to erosive rain and wind.

A healthy topsoil has high organic matter content with 50 percent pore space in the soil profile. High organic matter content allows water to be absorbed and infiltrated.

It is essential that exposed land and compaction be minimized during urban construction. Communities need to work with developers and contractors to limit compaction and soil loss during construction operations.

Soil Components

All soil is made up of air, water, decayed plant materials, numerous kinds of living and/or dead organisms (organic matter), and mineral matter (sand, silt, clay). The soil composition, however, can be dramatically changed by pedestrian and vehicular traffic, especially when the soil is wet. Soil components most easily changed are the amounts of soil air and water.



Composition of undisturbed soil, by volume

Composition of compacted soil, by volume

Restoring Soil Quality

Organic Matter

Increasing organic matter content increases biological life, the number of soil pores, and soil permeability. Compost, or decomposed organic material, is a great source of organic matter. Compost improves soil structure, aeration, water retention, drainage, and nutrient quality.

Deep Tillage

Deep tillage can be performed with machinery. Always have underground utilities and other underground plumbing or wires located and marked. It is best to perform deep tillage when moisture content is about 40 percent.

Vegetation

Establishing vegetation to cover bare soil is critical. A seeded lawn with a mixture of grass seed and compost is best for new lawns. It is often less expensive and establishes faster than sod. The higher organic matter content and improved soil structure in compost-seeded lawns can retain 80 percent more rainfall, resulting in less watering and fertilizer than sod lawns and less storm water runoff.

Native Landscaping

Native plants have a tremendous root structure. This deep root structure adds organic matter to the soil and increases infiltration. Use native landscaping strategically to manage rainfall and diversify urban landscapes.

More Information on Soil Quality

Find additional information about soil quality by visiting the following websites:

- www.iowasudas.org
- http://soils.usda.gov/sqi/
- www.lowimpactdevelopment.org
- www.cwp.org
- www.stormwatercenter.net